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# TRANSFORMATION of COOPERATION between BUSINESS ENTERPRISE and HIGHER EDUCATION SECTORS in INFORMATION ECONOMY

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*The article defines the role of government sector, business enterprise sector, higher education sector and private non-profit sector in processes of information economy formation. The author identifies the key current problems of cooperation between the higher education sector and business enterprise sector in Ukraine; the transformation of business enterprise sector's priorities of activities, and its requests to universities under the conditions of information economy formation. The directions of coordination of enterprises' and higher education institutions' interests with the identification of educational and research vectors of their mutually beneficial partnership are determined in the article.*

*Key words: information economy; business enterprise sector; higher education sector; higher educational institution; diversification; commercialization; information and communication technologies.*

**Urgency of the research.** In the conditions of the information economy formation the approaches to organization of national economy main sectors' activities are transformed, as well as the directions of their interaction and cooperation. The competitiveness of economic actors and of the national economy requires the implementation of effective communications and the development of information exchange channels between the vertices of the Quadruple Helix "government – business – higher education – non-profit sector". The enterprises' innovative activity as a factor of their competitiveness in current conditions requires the flexibility and dynamism of the higher education sector, in particular – the ability of its subjects to generate knowledge,

information, new ideas, to transfer the research results to the real economy through the commercialization processes. In this context it is urgent to identify the directions of modernization of the country's higher education system according to the changeable business demands; due to resource constraints and inadequate funding of higher education institutions it could become the bases of the diversification of universities' funding sources.

**Actual scientific researches and issues analysis.** The problems of information economy formation and development are the research objects of Ukrainian and foreign scientists. The fundamental bases of the information economy formation are developed by V. Andrushchenko, Y. Bazhal, D. Bell, B. Danilishin, M. Zgurovsky, M. Castells, J. Masud, F. Makhlup, M. Porat, E. Toffler, A. Chukhno, S. Shkarlet and others. In particular, D. Bell and M. Castells consider information as a resource for social development, and main productive force. For the first time the term "information economy" was used by M.Porat. E.Toffler emphasizes the exceptional need for in-depth scientific analysis of production, use and dissemination of information. P.Drucker puts the accent on the methodological necessity for the introduction of the concept of the information sector of the economy.

**Uninvestigated parts of general matters defining.** Despite the existence of number of scientific publications of domestic and foreign researchers, the issue of identification of vectors of cooperation between business enterprise and higher education sectors on the complementarity and efficiency principles in the conditions of the information economy requires in-depth research.

**Target setting.** The aim of the article is to identify the directions of modernization of the higher education system in accordance with the needs of business enterprise sector in the conditions of the information economy formation.

**The statement of basic materials.** Modern socio-economic, technological and technological tendencies of global development cause the following priority vectors of modification of the functioning profiles of the macroeconomic actors in the information economy:

- government sector - macroeconomic regulation; socio-economic, innovation, scientific and technical development forecasting; creating favorable conditions and stimulating economic agents to implement new technologies and innovations; guarantee of intellectual property rights;

- business enterprise sector - modernization of production processes on the basis of modern innovative information and communication technologies;

- higher education sector - training of highly skilled specialists capable for innovative thinking; providing scientific and technical progress of the country;

- private non-profit sector - promoting the development of innovative culture in society to raise the level of people's susceptibility to new approaches, technologies, products, etc.

In the article we use the European Commission's approach to the classification and definition of economy sectors. In particular, "higher education sector is composed of all universities, colleges of technology, and other institutes of post-secondary education, whatever their source of finance or legal status. It also includes all research institutes, experimental stations and clinics operating under the direct control of or administered by or associated with higher education establishments"; "business enterprise sector includes all firms, organizations and institutions whose primary activity is the market production of goods or services (other than higher education) for sale to the general public at an economically significant price" [3].

The transformation of the national economy subjects' activities under the conditions of transition to functioning on an information basis is accompanied by the changes in specificity and intensity of relations between them on a qualitatively higher level of complexity and coherence. In this context the

especial role is played by the higher education sector represented by higher educational institutions of different levels of accreditation and funding sources including their intellectual, innovative and research potentials. Therefore the higher education sector plays the role of a basic linking section within the Quadruple Helix "Government - Business enterprise - Higher education - Private non-profit sector ". The information economy causes modifications in the system of enterprises competitiveness factors increasing the influence of innovation, intellectual, technological aspects and stimulating them to functioning on the basis of following principles: dynamism (higher speed of transformation and efficiency of updating approaches to organization and conducting of business); informational (introduction of modern information and communication technologies in the processes of production, management and customer service; increasing the volumes of information resources using in the business activities); adaptability (regular monitoring and adequate adaptation to key global social and economic trends, taking into account national and regional specifics); modernity (generating ideas, introducing innovations into production, organizational and other business processes) [4; 7].

The business enterprise sector is increasing the demand for information resources, scientific and technical, qualitative educational services, thereby ensuring the growth of knowledge-intensive production, the pace of implementation of modern information and communication technologies, modernizing production processes, raising the innovation level and the competitive positions in the relevant markets. In this context the inquiries of modern innovative enterprises to the higher education sector are not limited only with the aspects of training of highly skilled specialists but are substantially changing, focusing on the issues of efficiency of research, inventive and patent activities of higher educational institutions. Moreover, the emphasis is put both on quantitative (volumes, speed of generation and transfer of knowledge and information, duration of implementation, planned costs, expected quantitative

results), and on qualitative (relevance, applied component, scientific value, competitiveness, expected effects) characteristics of services produced by the subjects' of the higher education sector.

The new functioning principles of enterprises intensify the development of higher education sector. The subjects of higher education sector influence the processes of information economy formation through the realization of educational (in 2016/2017 academic year 287 higher education institutions of the III-IV accreditation levels were training 1369.4 thousand future highly skilled specialists within a differentiated professional structure [8] (Table 1). However the Ukrainian higher educational institutions in today's globally highly competitive conditions face a number of economic (including financial: public funding reduction; necessity of funding sources diversification, modernization of financial mechanisms, regular updating of material and technical base, optimization of structure of universities budgets' expenditures, and etc.), social (massification of education; low level of social recognition; insufficient level of correlation between obtained educational level and wages; low average living standard of population, etc.), demographic (decrease in the enrolment rates; migration processes, etc.), global (internationalization of higher education; increasing competition in the global educational services market; activation of international youth mobility, etc.) challenges.

Table 1

**Dynamics of the Potential and Capacity Parameters of the Higher Education Sector in the Development of Scientific Activity in Ukraine [8]**

| Parameter | 2010 | 2015 | 2016 |
|---|---|---|---|
| Number of R&D organizations | 178 | 151 | 153 |
| Number of R&D personnel | 67588 | 39670 | 20717 |
| Financing of internal expenses on R&D, UAN thous. | 530708,9 | 590631,6 | 725496,3 |
| Internal expenses on fundamental research projects, UAN thous. | - | 217298,4 | 240442,6 |
| Internal expenses on applied research projects, UAN thous. | - | 265771,2 | 353690,2 |

The problems of the effectiveness of Ukrainian higher education look urgent through the prism of comparative analysis (Table 2). The basis for the information economy development is the research activity in the country, the intensity and effectiveness of which depend on the funding indicators. So we suggest realizing the comparative analysis of finance contributions from economy's sectors to research and development activities in some EU countries and Ukraine (with the identification of the higher education sector role). In the European Union countries the bigger rate of research and development spending is demonstrated by the business enterprise sector; that is also typical of Ukraine (there is a positive trend). At the same time, in the EU countries the higher education sector is actively involved in research and development activities, which is reflected in the financial parameters (on average, the second position in R&D financing after the business enterprise sector). In Ukraine the share of expenses of the higher education sector on R&D is lower; moreover - there is a negative tendency towards the reduction of R&D financing. The main reasons for this tendency are: low flexibility, inefficiency and insufficient adequacy of financial mechanisms of domestic higher educational institutions to modern economic realities.

At the current stage, unfortunately, we could identify two problems: the low development level of the contacts between the higher education sector and the business enterprise sector; and also the lack of real possibilities of the realization of domestic higher education institutions' potential. The economical and statistical analysis showed a number of problematic aspects, the main among which in the analyzed context are following:

- existence of some "distance" (gap) between the higher education, academic science and the real economy - both in educational (according to qualification, professional structure and number of staff training – without the necessary previous coordination with the labor market demand), as well as in

research (topics and degree of practical value of scientific results - without the necessary previous coordination with the business enterprise sector) vector;

- low level of innovation activity of the domestic business (comparing with the European average parameters), and also its low interest in conducting and financing research activities;

- lack of financing in the higher education sector, that causes problems of impossibility of fast modernization and updating of the material and technical base of educational and research processes [5]; lack of experience in effective approbation of fundraising tools; low diversification of funding sources; lack of universities' practice in introduction of endowment funds;

- underdeveloped commercialization mechanisms in higher educational institutions;

- problems of financial management in the educational sphere [10], etc.

At the state level should be developed and implemented the complex of systemic measures aimed at eliminating the listed above limiting problems. In today's conditions of the information economy formation the issue of cooperation within the chain "higher education - science - innovation - business" become relevance, because it forms the basis of competitiveness of economic actors and of national economy in general [1; 2; 6; 9]. It is important

Table 2

**Percentage of R&D expenses of different sectors of economy, in total expenditures,% [8]**

| Country | Business enterprise sector | | | | Government sector | | | | Higher education sector | | | | Private non-profit sector | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2014 | 2015 | Rate of growth, 2015 to 2010, % | 2010 | 2014 | 2015 | Rate of growth, 2015 to 2010, % | 2010 | 2014 | 2015 | Rate of growth, 2015 to 2010, % | 2010 | 2014 | 2015 | Rate of growth, 2015 to 2010, % |
| *EU-28* | *61,8* | *63,8* | *64* | *3,56* | *12,9* | *12* | *12* | *-6,98* | *24,3* | *23,4* | *23,2* | *-4,53* | *1* | *0,8* | *0,8* | *-20* |
| Bulgaria | 50,3 | 65,7 | 73,3 | *45,73* | 37,3 | 24,7 | 20,8 | *-44,24* | 11,8 | 8,8 | 5,4 | *-54,24* | 0,7 | 0,8 | 0,5 | *-28,57* |
| Estonia | 50,2 | 43,5 | 46 | *-8,37* | 10,6 | 11 | 10,8 | *1,89* | 38 | 44,3 | 41,4 | *8,95* | 1,2 | 1,2 | 1,8 | *50* |
| Spain | 51,5 | 52,9 | 52,5 | *1,94* | 20,1 | 18,8 | 19,1 | *-4,98* | 28,3 | 28,1 | 28,1 | *-0,71* | 0,2 | 0,2 | 0,2 | *0* |
| Latvia | 37 | 35,5 | 24,8 | *-32,97* | 23 | 24 | 25,6 | *11,30* | 40 | 40,5 | 49,6 | *24,00* | * | * | * | -- |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lithuania | 29,4 | 30,9 | 26,9 | *-8,50* | 17,5 | 17 | 17,2 | *-1,71* | 53,1 | 52,1 | 55,9 | *5,27* | * | * | * | -- |
| Germany | 67,1 | 67,5 | 67,7 | *0,89* | 14,8 | 14,8 | 14,9 | *0,68* | 18,2 | 17,7 | 17,4 | *-4,40* | * | * | * | -- |
| Poland | 26,6 | 46,6 | 46,6 | *75,19* | 35,9 | 24 | 24,4 | *-32,03* | 37,2 | 29,2 | 28,9 | *-22,31* | 0,3 | 0,3 | 0,2 | *-33,33* |
| Romania | 38,3 | 41,5 | 44 | *14,88* | 36,8 | 43 | 38,3 | *4,08* | 24,5 | 15,2 | 17,4 | *-28,98* | 0,4 | 0,4 | 0,3 | *-25,00* |
| Slovakia | 42,1 | 36,8 | 28 | *-33,49* | 30 | 28,3 | 27,9 | *-7,00* | 27,6 | 34,4 | 43,8 | *58,70* | 0,3 | 0,4 | 0,4 | *33,33* |
| Slovenia | 67,8 | 77,3 | 76,3 | *12,54* | 18,2 | 12,2 | 13,5 | *-25,82* | 13,9 | 10,5 | 10,2 | *-26,62* | 0,1 | 0 | 0 | *-100* |
| Hungary | 59,8 | 71,5 | 73,4 | *22,74* | 18,5 | 13,7 | 13,3 | *-28,11* | 19,9 | 13,5 | 12,1 | *-39,20* | * | * | * | -- |
| Czech Republic | 57,7 | 56 | 54,3 | *-5,89* | 21,7 | 18,2 | 20,4 | *-5,99* | 20 | 25,4 | 24,9 | 24,5 | 0,6 | 0,4 | 0,4 | -33,33 |
| *Ukraine* | *55,4* | *55,3* | *60,7* | *9,57* | *38,1* | *39* | *33,9* | *-11,02* | *6,5* | *5,7* | *5,4* | *-16,92* | *0* | * | * | -- |

to understand the mutual interests and the mutual benefits of both the higher education sector and the business enterprise sector in expanding the cooperation. In particular, the experience of leading world universities justifies the necessity of development of commercialization processes by higher education institutions. It should be noted that the commercialization of the research results carried out in the higher education sector has a positive impact on the parameters of the competitiveness and recognition of higher education institutions by the government, business and foreign partners. Besides, the commercialization leads to the filling of university budgets that is especially important because of numerous financial problems of most Ukrainian universities. In addition, the commercialization of the research results in the business enterprise sector contributes to the modernization of production processes, the implementation of modern information and communication technologies, the growing of innovation activity and competitiveness levels. In other words, the development of effective cooperation between the business enterprise sector and higher education sector makes the reputational, competitive effects and financial benefits (first of all - inflow of financial resources to the higher educational institutions budgets; reduction of enterprises expenses as a result of implementation of technical and technological innovations, increase of their profit as a result of successful introduction of product innovations, etc.).

We could identify two main vectors of modernization of economic relations between the sectors of higher education and business:

1) educational vector - training of the personnel for innovatively active enterprises, who would be capable for lifelong learning and demonstrating high productivity in the conditions of the information economy formation. Cooperation includes:

- enterprises - the orders on staff training in terms of professional and qualifications structure; specification and regular updating of the requirements to students' knowledge and professional competence, skills; conditions for students' practical training (practice, internship, experts' master-classes, participation in students' round tables, conferences, etc.);

- higher educational institutions - the organization of the educational process in accordance with the employers' requests; guarantee of high quality level of educational services; regular updating of information and communication technologies, use of licensed specialized software, informatization of training; implementation of innovations and new forms of education, based on modern information technologies (distance education); students' involvement in research activities, development of additional competences etc.;

2) R&D vector - joint initiation of advisory and expert support in the implementation of scientific and technical, innovative projects at different stages of their life cycle. Cooperation specified in the areas of sectoral responsibility includes:

- business enterprise sector - the orders on both types of researches: applied (focused on the solution of specific practical problems; usually medium-term duration; are currently dominated in Ukraine) and fundamental (oriented on the generation of new knowledge; usually long-term; at the current stage domestic enterprises demonstrate a low level of interest in financing

fundamental research projects); introduction of research results in real practice and production processes; participation in realization of innovation projects;

- higher education sector – realization of research activities; generation of new knowledge; inventive activity, patenting; providing adequate funding, material and technical support to research processes, scientists and laboratories; initiation of innovative projects; guarantee of high quality of scientific and technical products; transfer and commercialization of knowledge and information in the real sector of the national economy.

**Conclusions.** The formation of the information economy leads to the business enterprise sector' higher interest in the innovation, scientific and technological development, that could be demonstrated in increasing the scale of information resources use, the introduction of modern information and communication technologies; and also means the development and intensifying the cooperation with the higher education sector, whose subjects consolidate a powerful intellectual potential. The systematization of the mentioned in the article allows us to come to the conclusion about the predominance of financial problems in the higher education sector in Ukraine. The development of cooperation with the business enterprise sector is able to provide a partial solution to universities' financial problems.

The transformational changes should be realized at the national level (Ministry of Education and Science, Academy of Sciences) and micro level (higher educational institutions) taking into account various aspects of the higher education system, particularly: administrative (improvement of the educational management system at the national, regional, local and micro levels; orientation of development on globalization and internationalization of higher education, stimulation of innovative development, improvement of approaches to strategic planning and forecasting, guarantee transparency of educational and research processes), educational (flexibility of academic process at universities, stakeholders involvement to the development and

updating of training courses and programs), research (ensuring the competitiveness of research results, increasing their practical and scientific value, organizing of transfer of knowledge, information and technologies, patenting), financial (diversification of funding sources; fundraising; intensification of commercialization processes; optimization of the expenditures structure of higher educational institutions), etc. Successful implementation of these transformations involves the consolidation of efforts of government and local authorities, enterprises and business structures, higher educational institutions and research institutes, and the private non-profit sector.

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